REMARKS

Claims 1-4, 7-12 and 14-27 are pending in this application. By this Amendment, claim 6 is canceled without prejudice or disclaimer and claims 1, 11, 12, 24 and 25 are amended. Reconsideration in view of the above amendments and following remarks is respectfully requested.

The Office Action rejects claims 1, 4, 7, 9-11, 15-17, 20, 22-27 under 35 U.S.C. §102(e) over Liu et al. (U.S. Patent No. 6,451,703, hereinafter "Liu"). The Office Action also rejects claims 2, 3, 8, 12, 14, 18, 19, 21 under 35 U.S.C. §103(a) over Liu. Finally, the Office Action rejects claim 6 under 35 U.S.C. §103(a) over Liu as applied to claim 1, in further view of Schmitt (U.S. Patent No. 6,228,438). The rejections are respectfully traversed.

Claim 1 recites a method of etching a dielectric layer with selectivity to an underlying stop layer, comprising: supporting a semiconductor substrate in a plasma etch chamber of a plasma etch reactor, wherein the plasma etch reactor is a capacitively coupled plasma reactor having a powered showerhead electrode and/or a powered bottom electrode, the substrate including a dielectric layer over a stop layer, supplying an etchant gas to the plasma etch chamber with the showerhead electrode, and etching openings in the dielectric layer by energizing the etchant gas into a plasma state by capacitively coupling RF energy into the plasma etch chamber, the etchant gas comprising a hydrogen-free fluorocarbon gas represented by C_xF_y gas wherein $y/x \leq 1.5$, an oxygen-containing gas and optional carrier gas, wherein the plasma etch reactor comprises a dual frequency capacitively coupled plasma reactor and RF energy is supplied at two different frequencies to either the bottom electrode or at different first and second frequencies to the showerhead

electrode and bottom electrode, and wherein the pressure in the plasma etch reactor is 50 to 100 mTorr and temperature of the substrate support is +20°C to +60°C. Similarly, claims 24 and 25 recite novel, non-obvious combinations of features, which also include a dual frequency capacitively coupled plasma reactor, wherein the pressure in the plasma etch reactor is 50 to 100 mTorr and temperature of the substrate support is +20°C to +60°C.

The Office Action states that "it would have been obvious to one with ordinary skill in the art to use the popular commercial available plasma reactors as disclosed by Schmitt in the process of Liu in order to provide their art recognized advantages and produce an expected result." See page 5 of the Office Action.

However, a *prima facie* case of obviousness cannot be based on a modification of prior art reference if the modification changes the principle of operation of a reference. See MPEP §2143.01 (emphasis added). In MPEP §2143.01, the MPEP states "if the proposed modification or combination of the prior art would change the principle of operation of the prior art invention being modified, and the teachings of the references are not sufficient to render the claims *prima facie* obvious" (emphasis added).

Applicants submit that the principle of operation of Liu includes the use of a magnetic field and a MERIE chamber. Liu states:

> [b]ased upon the above described concepts, this invention utilizes the intrinsic advantage of these low F/C-ratio gases, combines the superior working conditions, including proper plasma density, adjustable magnetic field, and short residence time provided by an advanced MERIE chamber to tune the plasma composition and thus to obtain desirable polymerization for various critical dielectric etch applications.

See column 7, lines 55-62 of Liu (emphasis added).

As Liu states that its invention utilizes an adjustable magnetic field provided by an advanced MERIE chamber, Applicants submit that substituting a plasma reactor from Schmitt in place of the MERIE reactor of Liu would eliminate use of the magnetic field required by Liu. Thus, since substituting another type of plasma reactor from Schmitt for Liu's MERIE plasma reactor would change the principle of operation of Liu's invention, the teachings of the references are not sufficient to render the claims *prima facie* obvious.

Additionally, Liu also teaches away from other features of the claims. The Office Action states that:

> [t]he above cited claims differ from Liu by specifying various compositions (e.g., flow rate of etchants (such as claims 8 and 14) processing parameters (such as pressure and temperature in claim 12; RF energy in claim 2). However, they are recognized result-effective variables, and commonly determined by routine experiment.

See page 4 of the Office Action.

Applicants submit that, as recognized in MPEP §2144.05(III), "a *prima facie* case of obviousness may also be rebutted by showing that the art, in any material respect, teaches away from the claimed invention" (emphasis added).

Liu teaches that "[f]or high oxide etch rate, the chamber pressure should be no more than 40 milliTorr with no known lower limit in the range tested." See column 11, lines 45-47. Therefore, since Liu teaches an upper limit of 40 milliTorr for a chamber pressure, and as claims 1, 24 and 25 recite a pressure in a plasma etch reactor of 50 to 100 mTorr, which is clearly over Liu's upper limit of 40 milliTorr, Applicants respectfully submit that Liu teaches away from the claimed invention and thus any *prima facie* case of obviousness based on Liu is rebutted.

Also, with respect to temperature, Liu states that "[u]nillustrated fluid cooling channels through the pedestal 38 maintain the pedestal at reduced temperatures" (emphasis added). See column 4, lines 14-16. Further, that "MERIE plasmas tend to produce a significantly lower electron temperature, thereby reducing the charging effect" (see column 6, lines 34-36) and also that the only disclosed cathode temperatures are -20°C in each of Liu's examples (see Tables 1-4). As such, Applicants respectfully submit that Liu teaches away from a temperature of a substrate support between 20°C and 60°C and thus any *prima facie* case of obviousness based on Liu is rebutted.

For at least the reasons set forth above, Applicants respectfully submit that the pending claims are allowable. Withdrawal of the rejections is respectfully requested.

CONCLUSION

From the foregoing, further and favorable action in the form of a Notice of Allowance is earnestly solicited. Should the Examiner feel that any issues remain, it is requested that the undersigned be contacted so that any such issues may be adequately addressed and prosecution of the instant application expedited.

Respectfully submitted,

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